Comparison of Two Dexamethasone Intervention Time Points in Reducing Post-Operative Sequelae of Mandibular Fracture Osteosynthesis

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ABSTRACT

Background: Mandibular fracture osteosynthesis comes with mechanical and thermal assaults to surrounding tissues resulting in the sequelae of pain, trismus, and oedema. Dexamethasone is known to reduce these sequelae; pain, swelling and trismus, with varying outcomes, and the lack of a standardized regimen for its optimal effect in maxillofacial surgery remains a cause of concern to researchers.

Objective: To compare two dexamethasone intervention time points in reducing post-operative sequelae of mandibular fracture osteosynthesis

Methods: A total of 102 subjects with mandibular body fractures in the age bracket of 20-60 years were recruited into the study and divided into preoperative, intraoperative, and control groups. 4mg of dexamethasone was injected via the submucosal route into the intact mucogingival area below the fracture line, one hour before making the incision in the preoperative group, at the time of the incision for the intraoperative group, and injection of the same volume of 0.9% normal saline preoperatively for the control group. Following osteosynthesis, postoperative sequelae, and complications were assessed on postoperative days 1, 3, and 7.

Results: There was a reduction in pain, swelling, and trismus in both test groups compared to the control with a significant reduction observed in the intraoperative group.

Conclusion: Our results showed that the administration of 4mg submucous dexamethasone reduces postoperative sequelae after mandibular fracture osteosynthesis with the intraoperative administration resulting in a significant reduction in postoperative pain.

Keywords: dexamethasone, mandibular fracture, osteosynthesis, postoperative sequelae

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INTRODUCTION

Glucocorticoids are corticosteroids used widely, due to their anti-inflammatory action and proven safety. The glucocorticoids group comprises cortisone, dexamethasone, and prednisolone among others. They act by inhibiting vascular dilation, and fluid transudation and decrease cell turnover by inhibiting chemotaxis of inflammatory mediator-producing cells.[1,2] Dexamethasone is the commonest glucocorticoid due to its long half-life and quick onset and for this reason, it is indicated in most major surgical procedures like, orthognathic surgery, and open reduction internal fixation (ORIF) for facial fractures.[3] The mandible is a commonly fractured facial bone due mainly to its prominence and mobility.[4] This fracture often results from road traffic accidents, assaults, sports injuries, falls and work hazards, and with an increase in motorcycle and tricycle use in most Nigerian cities, mandibular injuries have become more frequent.[5,6] Surgical intervention to restore the mandible after a fracture is almost always associated with treatment sequelae such as pain, swelling, trismus (difficulty opening the mouth), and complications that negatively impact the patient's quality of life.[7,8] Over the years, efforts have been directed at reducing the inflammatory sequelae and complications that may arise postoperatively, thereby encouraging early return to function and pre-injury aesthetics for the patient. Several researchers have advocated the use of various medications, especially as it relates to third molar surgery, and dexamethasone seems favoured following the deluge of reports in the literature.[9,10] It can be administered orally, intravenously, intramuscularly, or submucosally. However, there is a lack of agreement on the optimal administration protocol. However, its use during mandibular fracture treatment is not as common, as there are fewer reports with several variations in dosage, timing, and route of administration.[11,12] This study intends to evaluate the clinical outcomes post mandibular fracture osteosynthesis, following the administration of the same dose of dexamethasone at varying intervention time-points through the same route but at different perioperative times.

MATERIALS AND METHODS

This study was a randomized, controlled, single-blinded trial that lasted 22 months between the periods of June 2020 – April 2022 and involved patients with mandibular body fractures treated at the study center's maxillofacial clinic using open reduction internal fixation (ORIF). The patients were randomly divided into three equal groups of interventions classed: preoperative, and intraoperative administration of 4mg dexamethasone (submucous injection) which constitute the test group, and control which was a preoperative administration of 0.9% normal saline as a placebo. Eligible patients were between 20-60 years old and had simple or compound fractures that occurred within 14 days and all cases were categorised using a table of random numbers and blinded from their study groups. Exclusion criteria included cases with systemic diseases, superimposed infections, and comminuted fractures. A complete review was undertaken with a thorough extra and intra-oral examination with radiographic evidence of fracture, using an orthopantomogram (OPG). The patients underwent standard procedures for miniplate osteosynthesis under local anaesthesia and were administered 4mg dexamethasone in the intact mucogingival region below the fracture line (Submucous) one hour before the commencement of osteosynthesis for the preoperative group, while the same dose of dexamethasone was administered submucous at the commencement of surgery for the intra-operative group and same volume of 0.9% normal saline was administered submucous at the commencement of surgery, for the control group. Facial swelling, inter-incisal distance, and pain intensity during surgery were measured at baseline and on postoperative days 1, 3, and 7. Facial swelling was measured according to the 3 lines and 5 reference points as described by Gabka and Matsumura[13] while mouth opening was measured from the maximum interincisal opening between the mesial incisal edge of the upper and lower central incisors using a pair of dividers and a ruler, and the pain was measured using the numerical rating scale.[14,15] The study was approved by the institution's research and ethics committee, and informed consent was obtained from participants after explaining the scope and purpose of the research.

RESULTS

A total of 102 patients with mandibular body fractures requiring ORIF were considered eligible for this study. They were divided into three groups of 34 patients in each group. The eligible patients' age ranged between 20 - 60 years and for data collation purposes. The age was captured in 3 sub-categorised subgroups of 20 – 29: 30 – 39 and >or = 40 years. The socio-demographic characteristics of the eligible subjects, and types of patterns of fracture across subjects, are captured in Table 1.

Pain

Pain assessment showed a significant decrease in pain in the intraoperative group by postoperative day 1 compared to an increase in the preoperative and control groups. There was no significant difference in pain assessment across pre-operative and intraoperative groups on days 3 and 7, but there was a mild decrease across these two groups compared to the control. Overall, the test groups appear to perform better than the control group. All other details are captured in Table 2.

Trismus

The preoperative and control groups experienced increased trismus on day 1 postoperative review which gradually improved on days 3 and 7 postoperative reviews, while the intraoperative group experienced less trismus on all postoperative days. However, the test groups were better than the control group (See Table 3).

Swelling

Swelling increased significantly across all groups on day 1 postoperative review and decreased significantly across all groups on postoperative days 3 and 7 as illustrated in Table 4. However, the preoperative group performed better on days 1, 3, and 7, compared to the intraoperative group, while the test groups overall performed better than the control group.

Complications

Mental nerve paraesthesia was the major postoperative complication observed in all groups, with the preoperative group experiencing more complications overall than the intraoperative group. But, the control group had the most complication compared to the other groups. All other postoperative complications are captured in Table 5.

Table 1: Socio-Demographic Characteristics of Subjects

	Preoperative (n=34) n(%)	Intraoperative (n=34) n(%)	Control (n=34) n(%)	Fractures (*n=102*) (%) Simple (n-56) n(%)	Compd (n-46) n(%)
Age group (Years)					
20-29	19(55.9)	20(58.8)	21(61.8)	33 (59)	27 (59)
30-39	10(29.4)	10(29.4)	10(29.4)	16 (29)	14 (30)
≤40	5(14.7)	4(11.8)	3(8.8)	7 (12)	5 (11)
Mean±SD	30.37±8.9	29.24±6.7	29.01±7.9		
Gender					
Male	33(97.1)	32(94.1)	31(91.2)	38(68)	34 (74)
Female	1(2.9)	2(5.9)	3(2.9)	18(32)	12 (26)
Marital status					
Single	24(70.6)	23(67.6)	6 (17.6)	29(52)	31(67)
Married	10(29.4)	11(32.4)	28(84.2)	27(48)	15(33)
Educational level					
Primary	4(11.8)	6(17.6)	3(8.8)	4 (7)	0
Secondary	21(61.8)	13(38.2)	21(61.8)	36(64)	30(65)
Tertiary	9(26.5)	15(44.1)	10(29.4)	16(29)	16(35)

Table 2: Comparison of median pain scores for groups (NRS)

	Preoperative (n=34) Media (Q1-Q3)	Intraoperative (n=34) Media (Q1-Q3)	Control (n=34) Media (Q1-Q3)	U-value
Baseline	5.0(3.0-6.0)	5.0(1.0-7.5)	5.0 (3.0-7.0)	0.157
Day 1 after intervention	6.0(4.0-7.0)	4.0(2.0-7.0)	7.0 (4.0-9.0)	12.321
Day 3 after intervention	3.0(1.0-4.0)	3.0(1.0-4.5)	4.0 (1.2-5.5.0	3.003

Day 7 after intervention	1.0(0.0-1.0)	1.0 (0.0-2.0)	1.0 (0.0-2.0)	2.196

U = Man Whitney U test

Table 3: The comparative mean score of trismus in groups.

	Preoperative (n=34) Mean±SD	Intraoperative (n=34) Mean±SD	Control (n=34) Mean±SD	p-value
Baseline	26.3±7.1	26.67±7.0	26.71±7.1	0.54.3
Day 1 after intervention	24.39±9.4	27.76±10.0	22.04±10.1	**0.011***
Day 3 after intervention	30.00±8.2	32.76±9.7	27.93±9.7	**0.018***
Day 7 after intervention	36.76±7.3	37.68±6.0	34.85±5.9	**0.046***

*Independent t-test

Table 4: The comparative mean score of swelling in groups.

	Preoperative (n=34) Mean±SD	Intraoperative (n=34) Mean±SD	Control (n=34) Mean±SD	t-value	p-value
Baseline	42.61±2.1	42.38±1.9	42.49±1.8	1.052	0.744
Day 1 after intervention	42.96±2.1	43.45±1.8	45.50±1.9	3.068	**0.001***
Day 3 after intervention	40.70±1.8	41.63±1.2	44.00±1.4	1.199	**0.001***
Day 7 after intervention	38.53±1.4	40.03±0.8	42.04±1.0	1.722	**0.001***

t= Independent t-test

Table 5: Comparison of postoperative complications in groups

	Preoperative (n=34)	Intraoperative (n=34)	Control (n=34)	X^2	p-value
Nerves impairment					
Present	8(23.5)	6(17.6)	9(26.5)	0.786	0.675
Absent	28(76.5)	28(82.4)	25(73.5)		
Implant failure					
Present	0(0.0)	1(2.9)	1(2.9)	1.020	0.600
Absent	34(100.0)	33(97.1)	33(97.1)		
Non-union					
Present	0(0.0)	0(0.0)	0(0.0)	0.000	1.000
Absent	34(100.0)	34(100.0)	34(100.0)		
Infection					
Yes	0(0.0)	0(0.0)	0(0.0)	0.000	1.000
No	34(100.0)	34(100.0)	34(100.0)		

X^2 = Chi-square

DISCUSSION

Both traumatic mandibular injury and its surgical correction result in damage to both hard and soft tissues, leading to both traumatic and iatrogenic-induced sequelae that characterises as pain, swelling, and difficulty in opening the mouth (trismus).[7] These inflammatory responses leads to the formation of a hematoma, which through chemotaxis, attracts cells that help the healing process.[16] However, prolonged inflammation can have negative effects on the healing process and the patient's quality of life, so it is important to minimize it to the barest minimum.[17] Several anti-inflammatory therapies have been researched and these comprise of pharmacological that is analgesics, corticosteroids and antibiotics, and non-pharmacological that is cryotherapy and laser application. [18-20] But this study focused on glucocorticoids and in particular dexamethasone and a few studies have shown varying clinical outcomes on its use to reduce inflammation associated with mandibular trauma and iatrogenically induced inflammation from ORIF.[21,22]

Reports on the effectiveness of glucocorticoids in reducing postoperative pain have yielded mixed results. In this study, two-time points of 4mg of submucous dexamethasone were administered, i.e., one preoperatively and the other intraoperatively for the test groups, and one preoperatively for the control, and our result suggested a decrease in pain on day 1 postoperative review in the intraoperative group compared to an increase recorded in the other groups. The other postoperative days recorded a decrease in pain across all groups. Overall, this day 1 postoperative pain decrease was adjudged to be due to the onset of action of dexamethasone intervention being within one hour of treatment commencement, following the intraoperative intervention, compared to the preoperative intervention. However, the subsequent postoperative days indicated a similar decrease in pain across all groups but the overall decrease for the control group was less than the test groups, suggesting dexamethasone action between postoperative days 1 - 3. In relation to other studies, the results were similar to some previous studies[17,23] and to further improve the dexamethasone effect, both studies went further to double the dexamethasone dose to 8mg and found no difference in the decrease of postoperative pain and swelling, indicating that there is no additional benefit from administering a higher dose of dexamethasone. In converse, Gersema et al[24] found no significant reduction in pain perception with the use of pre-operative glucocorticoids alone and thus, suggested adding non-steroidal anti-inflammatory drugs (NSAIDs). Concerning dexamethasone intervention time points, Dionne et al[25] observed no analgesia from the administration of 4mg dexamethasone one hour before surgery (preoperative), while Antunes et al[26] and Majid and Mahmood et al[27] used dexamethasone locally in their respective studies, and observed reduction in pain intensity on all postoperative review days. All studies (ours inclusive) seem to suggest that a decrease in postoperative pain would subsist irrespective of dexamethasone administration, an occurrence possibly missed by Antunes et al[26] and Majid and Mahmood et al,[27] but the dexamethasone group appears to decrease in pain intensity postoperatively than the control group. Furthermore, our study tended to show that the timing of dexamethasone administration, especially intra-operative, does affect pain reduction but this is far from a consensus by all authors.

Trismus is often caused by inflammation resulting from pain and swelling. Thus, dexamethasone's ability to reduce pain and swelling may also help alleviate trismus.[28] However in this study, only the intraoperative group observed a significant decrease on day 1 postoperative review compared to the other groups and this could be adduced to the onset of action of this dexamethasone intervention time point occurring within the hour of ORIF-induced inflammation, compared to the preoperative timepoint. That trismus decreased in test and control groups on days 3 and 7 postoperative reviews (although more reduction in the test groups) suggests a dexamethasone action with the intraoperative group acting better than the preoperative group possibly due to the onset of action of the intraoperative group within the hour of the iatrogenically induce inflammation. These results were similar to those of Deo[29] and Majid[23] and subsequent results were also similarly reported by other authors.[26,30,31]

Various studies[17,22,30] have reported that dexamethasone can significantly reduce facial swelling postoperatively and while there appears to be a consensus, the pattern of the decrease appears to be for debate. This study like others reported an initial increase on the postoperative day 1 review and subsequent decrease on postoperative days 3 and 7 reviews with the preoperative group having the better outcome compared to the intraoperative

group.[23,29,32] However, others reported a significant decrease in facial swelling by the second postoperative day review following preoperative administration of 4mg submucous dexamethasone.[33,34] While the reports that recorded an increase in swelling on a postoperative day 1 suggested this may have been due to trauma induced by drug injection, the postoperative day 2 swellings could not be explained. Concerning preoperative or intraoperative time points, our results suggest that the effect of dexamethasone on swelling may be influenced by the time of administration, as the trauma induced by intraoperative injection was more than the preoperative injection thus leading researchers to record it as an increased swelling.

Concerning postoperative complications in mandibular fracture treatment using dexamethasone, infection is the most commonly reported event,[11] and surprisingly none was reported in this study and this was possibly due to the sterile conditions under which the treatment was undertaken. However, mental nerve impairment was the most reported complication in this study compared to others and this probably was due to the use of only body fracture cases which has a close proximity to the mental nerve exit at its foramen. Concerning the relationship to the time point interventions, while the preoperative appears to have had more of this complication than the intraoperative, it was not statistically significant and thus made it difficult to explain why this distinction was not due to chance.

CONCLUSION

Our results showed that the administration of 4mg submucous dexamethasone reduces postoperative sequelae and complications after mandibular osteosynthesis as illustrated by the test and control data distinctions. However, the intraoperative administration appears to result in a reduction in postoperative pain, with clinical improvement in trismus while the preoperative appears to improve postoperative swelling. Therefore, while controversies persist regarding the best route and dose of dexamethasone for optimal results, the timing of administration may become an important factor in the determination of the optimum regimen.

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Conflict of interest
None Declared

REFERENCE

1. Adcock IM, Mumby S. Glucocorticoids. Handb Exp Pharmacol. 2017; 237:171-96.
2. Herrera-Briones FJ, Prados Sanchez E, Reyes Botella C, Vallecillo Capilla M. Update on the use of corticosteroids in third molar surgery: systematic review of the literature. Oral surgery, oral medicine, oral pathology and oral radiology. 2013; 116(5):e342-51.
3. Rocha-Neto AM, Nogueira EF, Borba PM, Laureano-Filho JR, Vasconcelos BC. Application of dexamethasone in the masseter muscle during the surgical removal of lower third molars. J Craniofac Surg. 2017; 28(1):e43-e7.
4. Pickrell BB, Hollier LH, Jr. Evidence-based medicine: mandible fractures. Plast Reconstr Surg. 2017; 140(1):192e-200e.
5. Oginni FO, Ugboko VI, Ogundipe O, Adegbehingbe BO. Motorcycle-related maxillofacial injuries among Nigerian intracity road users. J Oral Maxillofac Surg. 2006; 64(1):56-62.
6. Obimakinde OS, Ogundipe KO, Rabiu TB, Okoje VN. Maxillofacial fractures in a budding teaching hospital: a study of pattern of presentation and care. Pan Afr Med J. 2017; 26:218.
7. Naldini A, Carraro F, Baldari CT, Paccani SR, Bernini C, Keherly MJ, et al. The thrombin peptide, TP508, enhances cytokine release and activates signaling events. Peptides. 2004;25(11):1917-26.
8. Sakong Y, Kim YH, Chung KJ. Analysis of complication in mandibular angle fracture: champy technique versus rigid fixation. J Craniofac Surg. 2021; 32(8):2732-5.
9. Canellas J, Ritto FG, Tiwana P. Comparative efficacy and safety of different corticosteroids to reduce inflammatory complications after mandibular third molar surgery: a systematic review and network meta-analysis. Br J Oral Maxillofac Surg. 2022; 60(8):1035-43.
10. Diane Isabel Selvido BPB, Nattisa Niyomtham, Apiwat Riddhabhaya, Kadkao Vongsawan, Verasak Pairuchvej, Natthamet Wongsirichat. Review of dexamethasone administration for management of complications in postoperative third molar surgery. J Korean Assoc Oral Maxillofac Surg. 2021; 47:341-50.
11. Dongol A, Jaisani MR, Pradhan L, Dulal S, Sagtani A. A randomized clinical trial of the effects of submucosal dexamethasone after

surgery for mandibular fractures. J Oral Maxillofac Surg. 2015; 73(6):1124-32.
12. Oksa M, Haapanen A, Furuholm J, Thoren H, Snall J. Effect of perioperative systemic dexamethasone on pain, edema, and trismus in mandibular fracture surgery: a randomized trial. J Craniofac Surg. 2021; 32(8):2611-4.
13. Gabka J, Matsumura T. [Measuring techniques and clinical testing of an anti-inflammatory agent (tantum)]. Munch Med Wochenschr. 1971; 113(6):198-203.
14. Dworkin RH, Turk DC, Farrar JT, Haythornthwaite JA, Jensen MP, Katz NP, et al. Core outcome measures for chronic pain clinical trials: IMMPACT recommendations. Pain. 2005; 113(1&2):9-19.
15. Wood GD, Branco JA. A comparison of three methods of measuring maximal opening of the mouth. J Oral Surg. 1979; 37(3):175-7.
16. Schilcher J, Koeppen V, Aspenberg P, Michaelsson K. Risk of atypical femoral fracture during and after bisphosphonate use. Acta Orthopaedica 2015; 86 (1): 100–107
17. Grossi GB, Maiorana C, Garramone RA, Borgonovo A, Beretta M, Farronato D, et al. Effect of submucosal injection of dexamethasone on postoperative discomfort after third molar surgery: a prospective study. J Oral Maxillofac Surg. 2007; 65(11):2218-26.
18. Sortino F, Messina G, Pulvirenti G. [Evaluation of postoperative mucosa and skin temperature after surgery for impacted third molar]. Minerva Stomatol. 2003; 52(7-8):393-9.
19. Markovic A, Todorovic L. Effectiveness of dexamethasone and low-power laser in minimizing oedema after third molar surgery: a clinical trial. Int J Oral Maxillofac Surg. 2007; 36(3):226-9.
20. Osunde OD, Adebola RA, Omeje UK. Management of inflammatory complications in third molar surgery: a review of the literature. Afr Health Sci. 2011; 11(3):530-7.
21. Nair RB, Rahman NM, Ummar M, Hafiz KA, Issac JK, Sameer KM. Effect of submucosal injection of dexamethasone on postoperative discomfort after third molar surgery: a prospective study. J Contemp Dent Pract. 2013; 14(3):401-4.
22. Beirne OR. Corticosteroids decrease pain, swelling and trismus. Evid Based Dent. 2013; 14(4):111.
23. Majid OW. Submucosal dexamethasone injection improves quality of life measures after third molar surgery: a comparative study. J Oral Maxillofac Surg. 2011;69(9):2289-97.
24. Gersema L, Baker K. Use of corticosteroids in oral surgery. J Oral Maxillofac Surg. 1992; 50(3):270-7.
25. Dionne RA, Gordon SM, Rowan J, Kent A, Brahim JS. Dexamethasone suppresses peripheral prostanoid levels without analgesia in a clinical model of acute inflammation. J Oral Maxillofac Surg. 2003; 61(9):997-1003.
26. Antunes AA, Avelar RL, Martins Neto EC, Frota R, Dias E. Effect of two routes of administration of dexamethasone on pain, edema, and trismus in impacted lower third molar surgery. Oral Maxillofac Surg. 2011; 15(4):217-23.
27. Majid OW, Mahmood WK. Effect of submucosal and intramuscular dexamethasone on postoperative sequelae after third molar surgery: comparative study. Br J Oral Maxillofac Surg. 2011; 49(8):647-52.
28. Klongnoi B, Kaewpradub P, Boonsiriseth K, Wongsirichat N. Effect of single-dose preoperative intramuscular dexamethasone injection on lower impacted third molar surgery. Int J Oral Maxillofac Surg. 2012; 41(3):376-9.
29. Deo SP. Effect of submucosal injection of dexamethasone on postoperative sequelae of third molar surgery. JNMA J Nepal Med Assoc. 2011; 51(182):72-8.
30. Graziani F, D'Aiuto F, Arduino PG, Tonelli M, Gabriele M. Perioperative dexamethasone reduces post-surgical sequelae of wisdom tooth removal. A split-mouth randomized double-masked clinical trial. Int J Oral Maxillofac Surg. 2006; 35(3):241-6.
31. Moraschini V, Hidalgo R, Porto Barboza E. Effect of submucosal injection of dexamethasone after third molar surgery: a meta-analysis of randomized controlled trials. Int J Oral Maxillofac Surg. 2016; 45(2):232-40.
32. Saravanan K, Kannan R, John RR, Nantha Kumar C. A single pre-operative dose of sub mucosal dexamethasone is effective in improving post-operative quality of life in the surgical management of impacted third molars: a comparative randomised prospective Study. J Maxillofac Oral Surg. 2016; 15(1):67-71.
33. Skjelbred P, Lokken P. Post-operative pain and inflammatory reaction reduced by injection of a corticosteroid. A controlled trial in bilateral oral surgery. Eur J Clin Pharmacol. 1982;21(5):391-6.

34. Arora SS, Phull T, Kumar I, Kumar A, Kumar N, Singh H. A comparative study of the effect of two dosages of submucosal injection of dexamethasone on postoperative discomfort after third molar surgery: a prospective randomized study. Oral Maxillofac Surg. 2018; 22(2):225-30.